

**IDAHO STATE HIGHWAY 21, CANYON CREEK  
WINTER OPERATING PLAN  
IDAHO TRANSPORTATION DEPARTMENT**

August 5, 1993  
Revised November 13, 1997  
Revised March 31, 2004  
Revised January 12, 2007  
Revised December 14, 2007

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## **1.0 INTRODUCTION AND BACKGROUND**

State Highway 21 follows Canyon Creek, a tributary drainage of the South Fork of the Payette River, to the Banner Summit. The highway was opened as a gravel road in 1964 and subsequently paved in 1969. The roadway is on the State Highway System under the jurisdiction of the Idaho Transportation Department (ITD) and constructed within a deeded easement of the USDA Forest Service. This Winter Operating Plan applies to that portion of Highway 21 prone to avalanche activity starting at the Grandjean Avalanche Gate (milepost 93.83) to the Banner Summit Avalanche Gate (milepost 105.45).

The avalanche hazard on SH-21 (mileposts 93.83 to 105.45) is recognized and documented by the Canyon Creek Snow Avalanche Atlas (Bowles 1988). The Hazard Index rates this section of highway in the very high hazard category, due to the high concentration of major slide paths, coupled with a high frequency of avalanche activity along a relatively short section of highway. Fifty-four avalanche paths were documented in 1988 between the Grandjean turnoff and Banner Summit (shown in Figure 1). Additional avalanche paths have since been documented.

In 1986 the Governor developed an order mandating SH-21 remain open throughout the winter season. In 1988 Idaho Transportation Board authorization was given to conduct an in depth analysis of the Canyon Creek area with a plan for safe use by the traveling public and maintenance personnel. By August of 1988 a Snow Avalanche Atlas was developed. The Atlas, fashioned after the avalanche program established by the Utah Department of Transportation's program for Little Cottonwood Canyon, Utah route 210, contains recommendations for reactive and proactive approaches to highway maintenance of the avalanche areas. From the Atlas, the original Winter Operation Plan was developed indicating structured procedures for opening and closing of the highway, level of responsibility for emergencies, and requirements for avalanche forecasting.

In 1997 the Idaho Transportation Board approved a resolution on winter closures of SH-21. The resolution states that ITD will keep the road open until avalanche indicators justify closing the road. A news release in September 2007 also clarified that the ITD Idaho City Maintenance Foreman has the authority to close this section of roadway when the possibility of avalanche activity develops. If avalanche forecasting indicates possible avalanche activity, ITD will close the highway and keep it closed until the danger passes.

In 2004, Chris Stethem & Associates Ltd., Snow Safety Services, in Alberta Canada was contracted by the Idaho Transportation Department to conduct an updated analysis of the Canyon Creek area and current winter operating procedures and to evaluate options for proactive avalanche control. The report concluded that the average winter road closure of 60 days per year could potentially be reduced by 50 percent with a proactive avalanche control program.

In 2005 the Idaho Transportation Board approved a project to fund the initial capital expenditures required for an avalanche control program in the Canyon Creek section of

the SH-21. In August 2005 the ITD requested a permit from the USDA Forest Service to pursue an avalanche control program using explosives to bring down snow in a controlled manner to reduce road closures and improve highway safety.

This Winter Operating Plan includes avalanche control work utilizing explosives as permitted by the USDA Forest Service and has been approved by the USDA Forest Service. Changes to this plan require approval by the USDA Forest Service.

## **2.0 WINTER HIGHWAY SAFETY AND OPERATIONS**

As stated in the report presented by *Stethem and Associates*, the Hazard Index in Canyon Creek is very high. The Hazard Index is an internationally recognized numerical expression of the avalanche hazard on a road, calculating the probability of vehicles being hit and weighted according to the severity of expected damage. Hazard Index categories range from very low to very high.

The importance of keeping the highway in the Canyon well maintained during moderate storms is very important considering the Hazard Index. When the road narrows and the turnouts gather snow, it makes it more difficult for traffic to flow smoothly or turn around if necessary. These two factors combined can raise the hazard, as vehicles spend more time exposed under the avalanche paths.

### **2.1 Maintenance**

Winter maintenance operations on SH-21 conform to the Idaho Transportation Department Maintenance Manual and in particular Winter Maintenance Standards, Section 330, and Figure 330.0-A and 330.0-B and Administrative Policy A-05-06. This section of SH-21 has a Level 3 (green) service rating for winter maintenance.

Turn around areas are maintained at both the Grandjean and Banner Summit avalanche control gates by the ITD. In the interest of public and employee safety State Highway 21 can be ordered closed by the ITD. Per the Maintenance Manual Level 3 Winter Maintenance Standards *"In areas that are prone to avalanches, the road segment shall be closed and remain closed until all danger of avalanches has ended."*

### **2.2 Signing**

All highway signs on SH-21 are listed in the ITD Sign Inventory. Special purpose signs are as follows:

#### **Chains or Snow Tires Advised**

These are used to inform the public of chain up advisory. The flip up signs are located at mileposts 93.39 and 105.

#### **Slide Area No Stopping & Slide Area No Parking**

These are used to reduce the hazard to highway users by prohibiting stopping or parking for the entire length of highway subject to major avalanches. There are 9 signs located at



mileposts 96.05, 96.40, 97.95, 99.15, 100.5, 102.27, 103.25, 104.11, and 104.90. These signs are discretionary and enforced by the Boise County Sheriff.

### **Emergency Stopping Only**

Posted to remind the public not to stop along this section of highway, and are posted in known Low Hazard Areas. Low Hazard Areas are defined as areas not prone to, or not having a history of avalanche activity. Three of these areas are located between mileposts 97.45 to 97.75, 100.55 to 100.95, and 101.21 to 102.23. The postings are regulatory and are enforceable by law enforcement.

### **Staging Area Signs**

Identified by orange disks, with milepost markings on each, are placed at Low Hazard Areas. A Low Hazard Area is defined as an area that has little to no history of avalanche activity. These signs identify staging areas for highway maintenance and rescue workers as relatively safe locations for emergency stopping, staging work, or evacuation activities. They are located at mileposts 96.63, 98.0, 99.9, 101.6 and 104.0. Note: the Emergency Stopping Only areas, identified above, can be used as staging areas as well.

### **Avalanche Area Next 11 Miles No Stopping**

These signs are to warn the traveling public that they are entering an avalanche prone area. The signs are located at milepost 94.92 for north bound traffic and milepost 105.03 for south bound traffic.

### **Avalanche Gates**

The Grandjean (milepost 93.83) and Banner Summit (milepost 105.45) avalanche gates when closed are posted with regulatory signs reading: AVALANCHE AREA CLOSED AVALANCHE CONTROL WORK WITH EXPLOSIVES MAY OCCUR AT ANY TIME NEXT 11 MILES. These are to be enforced by law enforcement when notified by ITD of road closure.

In addition a sign will be posted at all times within 500' of each avalanche gate which will read:

AVALANCHE AREA  
ROAD CLOSED DURING  
AVALANCHE CONDITIONS EXTREME DANGER FOR  
VEHICLES SNOWMOBILERS AND SKIERS  
DURING CLOSURES CONTROL  
WORK WITH EXPLOSIVES  
MAY OCCUR AT ANY TIME

*(These signs are being fabricated in December 2007).*

### **Blasting Operations**

Temporary signs at the gates will not be posted with a warning statement to have radio transmitters turned off as described in the Forest Service special use permit, as no electronic detonating systems will be utilized for avalanche control work.

## **Dynamic Message Signs**

These signs are to inform the traveler of road closures as far in advance as possible. When the decision to close the road is made, ITD will notify State Communications of current conditions. State Communications posts pre-established messages via telephone line. Site specific messages can be posted at each individual location, with the use of a hand held key pad located in each controller cabinet by authorized personnel. Messages to be posted must be approved through the District 3 Assistant District Engineer (Operations) prior to posting.

### **Message sign locations are as follows:**

SH-21	MP 8.128	Boise
SH-21	MP 39.01	Idaho City
SH-21	MP 72.73	Lowman
SH-21	MP 129.308	Stanley
SH-55	Banks to Lowman Highway (100' east of SH-55)	
SH-55	MP 50.2	Boise
SH-75	MP 244.3	Challis ( <i>installation is planned in Summer of 2008</i> )

In emergency situations additional signs can be placed by maintenance personnel from Lowman and Stanley.

## **2.3 Traffic Control**

Temporary emergency traffic control is the Boise County Sheriff's responsibility, although on-site ITD personnel may assist. Long term (more than one day) road closures in the Canyon Creek area are behind closure gates controlled by ITD.

## **2.4 Highway Traffic Counter**

Two Traffic Talley 2001 Vehicle Classifier/Counters are located on State Highway 21, one near each avalanche gate. The counter at the Grandjean Gate (MP 93.83) is linked via telephone. The counter at the Banner Summit Gate (MP 105.45) is accessed by Data Radio. Both use Trafman for retrieval of the data, which includes time, date, speed, direction, and overall length of traveling vehicles. The traffic counters are accessed for confirmation of vehicles egress of the area.

## **2.5 Road Closures**

Highway control gates are maintained by ITD at the Grandjean Junction (MP 93.83) and at Banner Summit (MP 105.45) to restrict traffic during periods of high avalanche danger or when road conditions become too hazardous for travel. These conditions are determined in accordance with Section 3.0. The decision to close the road is the responsibility of ITD. Gate closure is the responsibility of ITD, District 3, although assistance can be requested of District 4. When a road closure is imminent State Communications will be notified and will follow the Road Closure Procedures, Section 4.1.

## **2.6 Rescue Caches**

Three rescue caches are located in the 11.62 mile stretch between the avalanche closure gates, at mileposts 95.67, 97.65, and 105.44. The contents are predominately for search and rescue. The Lead Forecaster is responsible for ensuring caches are inventoried annually and equipment updated as necessary. Appendix B contains a complete inventory list of supplies to be maintained in each cache. The structures can also be utilized as emergency shelters and contain minimal provisions.

## **2.7 Heliport**

There is a designated helicopter landing site located at milepost 95.66, near one of the rescue caches. Exact coordinates of the landing site are: latitude 44° 10' 8" and longitude 115° 14' 8" and at an elevation of 5268 feet above sea level. The site is utilized by the air ambulance service when necessary and will be used for staging of helibombing activities when the road is closed due to avalanche hazard. Although refueling of helicopters may be necessary, at no time will fuel be stored at this site. This site is posted for Emergency and Authorized Vehicles Only. These signs are regulatory and enforceable by law enforcement.

## **2.8 Employee Safety and Training**

All ITD employees working in the Canyon Creek area must complete the annual safety training on snow avalanche recognition and safety and search and rescue. This includes search and recovery with the aid of snow probes and transceivers.

Avalanche forecasters will not enter the avalanche area with out accompaniment of a trained assistant or ITD employee trained in appropriate search and rescue techniques. All personnel entering the Canyon shall have on their person an up to date operational transceiver during winter months. Additional emergency equipment and personal emergency gear will be carried in each vehicle and is the responsibility of the driver of each vehicle. Appendix B lists specific individual safety equipment and equipment to be carried in each vehicle. Maintenance personnel are responsible for ensuring the equipment is inventoried and inspected annually for defects and deterioration with age and replaced as necessary.

During periods of increasing avalanche hazard, employees shall check-in when entering, and again when exiting the Canyon Creek area with the Lowman Lead Worker, the Lead Forecaster or State Communications. Snow removal operations will then be conducted with two vehicles separated or staggered and will communicate their locations via the radio by calling out mile marker posts to each other as they proceed through the canyon.

Stopping in the Canyon should also be avoided but if necessary park only in the low hazard areas, identified with an orange round sign, and stay with the vehicle. In the event of a vehicle breakdown every attempt should be made to stay in the vehicle, get to a low hazard area and notify State Communications of vehicle condition, location, and where you can be located. If the breakdown occurs in an avalanche chute location, attempts should be made to relocate to the nearest low hazard area.



All ITD employees actively participating in avalanche control are required to attend specialized training in the handling, use, and storage of explosives. All ITD employees serving as a member of the helibombing crew are required to attend a preflight training session provided by the Contractor providing the Pilot and aircraft.

## **2.9 Communications**

ITD vehicles are equipped with radios capable of contact with both Districts 3 and District 4. Additional hand held radios are available. Due to the configuration of the terrain within the Canyon Creek area, an additional repeater has been added to the weather station situated at the top of the western ridge line; this should minimize the shadow areas and dead zones, but does not eliminate them. In an emergency, a telephone in a lock box maintained by ITD is located near the Grandjean avalanche gate, MP 93.82. As technology advancements allow, communication systems will be upgraded to assure quick response in the event of a life threatening situations.

## **2.10 Human Resources in Canyon Creek**

The need to utilize and retain experienced highway personnel with avalanche experience is paramount. It takes time and extensive training to recognize avalanche development, behavior, safety, search and rescue procedures, and control techniques. Even for trained professionals it is recognized that it takes years to learn the idiosyncrasies of a specific area.

The Maintenance Foreman is responsible for overall highway maintenance, allocation of maintenance resources, and maintenance operations on State Highway 21 in Canyon Creek. Per ITD Board direction, the Maintenance Foreman has the responsibility of opening and closing Canyon Creek to the public. The Lowman Lead Worker will assume these responsibilities in the Foreman's absence. The Lead Avalanche Forecaster reports directly to the District 3 Region 2 Engineer or delegate and is responsible for overseeing avalanche control activities, avalanche forecasting and advising when roadway closures are necessary due to avalanche hazard and as the avalanche hazard declines, in determining when it is safe for maintenance activities and for reopening to the traveling public. The Lead Avalanche Forecaster is responsible for providing such determinations to the Maintenance Foreman or Lead Worker for action. All work by the forecasters will be in coordination with the Maintenance Foreman or Lead Worker and in accordance with the established chain of command.

The utilization of experienced equipment operators who have been trained in avalanche safety and recognition and have experience in the Canyon Creek area and who are able to provide the avalanche team with additional sets of eyes and observations within the canyon is essential. Even with the use of site-specific weather forecasts, weather in Canyon Creek is often unpredictable. Experienced trained personnel and extreme caution is required. All personnel and crews entering the canyon during avalanche season must have the appropriate annual avalanche training.

To the extent possible and as resources allow, Lowman maintenance crew personnel who have been trained in avalanche safety and recognition and who have experience in the

Canyon Creek area will be utilized as members of the avalanche team and will continue to participate in observations, snow pit testing and forecasting.

### **3.0 AVALANCHE FORECASTING**

Snow avalanche science is dynamic and constantly changing with the advancements in technology and procedures within the International arena.

Avalanche forecasting is a scientific method for the prediction of snow avalanche activity and is essential to maintaining the safety of the traveling public and ITD employees. Avalanche forecasting is the art of analyzing the snow pack stability by utilizing data obtained from current and future weather conditions, snow pack testing and the experience of trained forecasters.

#### **3.1 Local Weather / Observations / Snow Pit Sites**

Local weather can be obtained via the internet at; <http://www.wrh.noaa.gov/boise/> or <http://www.accuweather.com>. These sites can be utilized for long range planning in the Canyon Creek area. For more immediate site specific weather information, utilized for avalanche forecasting, there are three weather stations installed and maintained by ITD. One each at MP 96.28 and MP 99.75, on the top of the western ridge, and one at Banner Summit, MP 105.5. The three weather stations are strategically located at different elevations to provide real-time weather conditions as close to the avalanche start zones as is practical. These weather stations are radio activated to provide immediate accurate weather data to ITD forecasting personnel. Contract weather services that provide "site specific forecasts" are utilized.

Observations of snow pack and weather will begin no later than the first snowfall of the season and continue until the seasonal hazard to the road has ended, usually October through March. Weather forecasts are accessed daily. During storms, and when accumulations of snow develop, more frequent intervals will be necessary unless potential avalanche hazards exist resulting in a road closure.

The snow pit site most often used for snow testing is located at Banner Summit at MP 105.5. A second snow pit site is currently being developed near the new weather station location at Fox Creek at MP 96.28 which will allow for testing without entering the avalanche hazard areas in the Canyon. The sites are used for excavating snow pits and obtaining data utilized in avalanche forecasting that best represent current snow pack conditions. Any study site should have an open area approximately the same diameter as the height of surrounding trees. In the event of a road closure, due to an avalanche or potential avalanche, alternate sites can be used exclusively until such time the Banner Summit site can be accessed. Additional field snow pit locations may be utilized for a broader perspective of the snow pack conditions and to increase our data base, but only when these locations can be accessed safely.



### **3.2 Snowpack Testing, Analysis and Documentation**

Due to the unique nature of snow avalanche hazards, information must be collected about relevant factors regularly, even daily, and evaluated continually (McClung & Schaerer, 1993). Monitoring and analysis of avalanche hazard or threat requires the interpretation of information and observations by experienced, trained individuals with currency in subject knowledge. Procedures for avalanche hazard analysis are described in the Canyon Creek Avalanche and Weather Observations Guidelines (Conger 2000).

Snow pack testing and observation is the primary tool used in Canyon Creek avalanche forecasting. Snow pack testing begins in a snow pit excavated to natural ground level. Information collected includes observations, weather conditions, ambient air temperature, temperatures within the snow pack at specified depths (beginning at ground level and at 10 cm increments to the top), snow pack depth noting isolated layers, hand hardness of the snow, shear test, snow grain size and type, snow density, moisture content, humidity, wind speed and direction, solar radiation and identification of the shear layers. All these factors contribute to the stability of the snow pack. It is imperative to keep up with the latest advancements in testing, training and technology.

The information collected is entered into the Sno-Pro 2000 database program and is graphed. The information and graphs are utilized by ITD forecasters to determine snow pack stability for determining the safety of the Canyon Creek area. Weather forecasts and other information regarding highway closures and actual avalanche activity that reach the highway are also documented on a daily basis with as much detail as possible. Data obtained during surveys conducted prior to and during highway reopening operations is also documented. It is essential that current and accurate information be collected throughout each winter season.

As a secondary tool, various forecast models, developed specifically for the Canyon Creek area and that represent various snow conditions, are available. Appendix D contains specific information on the forecast models available for Canyon Creek.

All data obtained will remain on file at the ITD Maintenance Office in Lowman to provide an ongoing history. Current industry standards recommend record retention for 100 years minimum. All records shall be retained indefinitely. At the end of each season the summary of that seasons data and the charts will be sent to a print shop for duplication, with the original retained indefinitely at the ITD Maintenance Office in Lowman and the duplicates retained in the District 3 Region 2 office.

Training, testing and testing procedures, documentation, and electronic programs utilized may change as necessary to keep up with technological advances in industry standards.

## **4.0 AVALANCHE CONTROL**

The information contained within this section has been compiled from a combination of resources, operating plans from neighboring State transportation departments, and the

*Avalanche Handbook (McClung/Schaerer, 1993)*, an accepted reference text pertaining to the avalanche phenomenon.

The avalanche control procedures contained herein represents the ITD's plan for the implementation of a safe, effective and environmentally sound avalanche control program. The ITD, working in partnership with the USDA Forest Service, will need to continue to adjust and refine the program for optimum effectiveness and safety as experience is gained, advancements in technology become available, resources change and as the dynamics of the Canyon Creek area evolves.

Avalanche control activities may vary slightly in operations and procedures as they are refined but, materials used, and general location shall remain unless approved through the Lowman Ranger District of the USDA Forest Service. Avalanche control activities include:

- helicopter delivery of explosives to avalanche paths within the project area defined in Figure 2 & Section 4.1;
- pentelite charges fired from an "avalauncher" operated from a stationary platform positioned in the turn-out at milepost 97 directed at three separate avalanche paths west of the highway (MP 96.86, 96.88, and 96.92). Other avalauncher locations will be discussed and evaluated by ITD and the Forest Service during the course of the avalanche season;
- hand placed pentelite charges at cut banks near milepost 104 and 97.4 and as feasible, hand placed ANFO or pentelite charges in avalanche start zones identified in Figure 2 as Primary Targets.

It is expected, on average, that three to six control missions per season will be required. However, up to 15 missions could be conducted between November and April due to unusual variability of winter snow pack conditions. The location of avalanche control operations shall be contained to the active avalanche paths identified in the Canyon Creek Snow Avalanche Atlas and the more recently documented avalanche paths between milepost 94 and milepost 105. Within this general area where currently there are no identified active avalanche paths, no control procedures are to be planned. However, in the unlikely event these areas begin to produce avalanche activity, they too could be considered for control operations.

#### **4.1 Road Closure Procedures**

Road closure is based on the avalanche forecasting and observations of the ITD forecasters, to reduce the hazard to the highway users and ITD personnel. Closure times can and will vary due to weather conditions, the severity of the avalanche danger, snow pack, and fluctuating temperatures. In order to minimize confusion and excessive costs, road closures will remain in effect until such time as the forecasters are reasonably confident the roadway can remain open for a continuous 24 hour period.

#### **General Procedures**

Road closures are normally initiated by ITD Maintenance personnel. In the event of imminent closure as much notice as possible will be given to District 3 management to allow for appropriate notifications to be made. When requested by State Police, County

Sheriff or Forest Service, ITD will respond and evaluate the situation as soon as possible. If ITD Maintenance personnel determine there is an immediate danger, closure procedures will be started immediately, and contact with District 3 management made as soon as possible. Notification will immediately be made to State Communications who will follow the closure procedures outline in Appendix A.

### **Dispatch Procedures – State Communications**

State Communications will be notified immediately and will send the appropriate messages to the dynamic message signs, will post the closure on the CARS 511 system, and will follow the procedure in Appendix A. State Communications will maintain documentation of the closure, date, time, reason for closure, requesting party for the closure, and times of notifications. It is the responsibility of ITD Maintenance personnel to relay the appropriate information to State Communications at the time the closure is being implemented.

### **Sweep Procedures**

A person will be stationed at the lower gate to allow south bound traffic out and to prevent north bound traffic from entering the canyon. A second person will make a sweep up through the canyon, closing the gate at Banner Summit, if not already closed, and back to verify all motorists have exited the area. The gate at Grandjean will then be closed and locked. In extreme weather cases District 4 personnel may be requested to assist at the upper end, due to accessibility or potential hazards. Procedures may vary depending on conditions.

In the event an avalanche has hit the road prior to road closure, ITD personnel will immediately notify State Communications and begin road closure procedures. The traffic counter will be reviewed by ITD Maintenance personnel to determine if there are potentially stranded motorists. In the event of stranded motorists, Boise County Sheriff's office will be notified and search and rescue procedures shall be initiated.

## **4.2 Reopening Procedures**

When considering reopening of the road, the avalanche hazard will be evaluated by the avalanche forecasters. This includes reopening following avalanche control operations. When possible, a flight over the area will be made to assist in the assessment of the clean-up work required and evaluate the snow remaining in the avalanche tracks. When conditions allow maintenance crews will enter the area, behind closed gates, and clear the roadway of snow and debris. When the roadway is clear and forecast test results are favorable, Maintenance personnel will notify State Communications to begin road-opening notifications using the same procedures found in Appendix A. All agencies and personnel will be notified of the change in road status as soon as practical. State Communications will maintain documentation of the opening date, time, and notifications made.

All surveys and snow removal operations will generally be conducted during daylight hours. Utilization of the most experienced and trained personnel for surveys and snow



removal operations are essential for the safest and most expedient reopening of the Canyon. All personnel working in the Canyon shall have on their person an operational transceiver. A list of individual safety equipment and items is listed in Appendix B.

Vehicles in the Canyon should stay separated or staggered in operation to reduce the hazards to as few vehicles as possible, and operators should stay aware of the location of their nearest coworkers and Low Hazard areas, for quick response in an emergency.

### **Initial and Subsequent Surveys**

Initial surveys are made to assess avalanche hazard prior to allowing maintenance personnel to clear the roadway for opening. Initial surveys consist of observations and collection of data for the establishment of a base line for the detection of changes occurring within the snow pack. It is important, when possible, to conduct the initial survey the day prior to actual snow removal activities. This establishes a base line that can be referenced against on subsequent surveys.

A secondary survey will be conducted an hour to two hours before snow removal operations begin. This allows the survey personnel adequate time to conduct the survey, compare data with the initial survey, process the information, and provide conclusions to the Maintenance Foreman as to whether or not there is a sufficient safety margin for personnel to conduct maintenance work.

Once conditions are such that maintenance work can be pursued, the Lead Avalanche Forecaster will provide the Maintenance Foreman or Lead Worker with the limits of safe work areas for snow removal operations. Maintenance crews will not exceed the limits of areas to be worked until such time that the Forecaster determines the Canyon relatively safe in its entirety. In the event of untimely weather conditions causing snow instability the Forecaster will notify the maintenance to suspend operations and exit the area immediately.

Continued surveys will be conducted while equipment and personnel are in the area. Updates on snow pack conditions will be provided to the Maintenance Foreman or Lead Worker on a regular basis.

It is necessary for the personnel conducting the surveys to take advantage of windows of opportunity in the Canyon as they arise. Information gained through surveys is vital when considering and evaluating conditions for reopening. A missed opportunity for a survey can delay roadway opening longer than necessary.

### **Survey Procedures**

Surveys will be accomplished utilizing personnel who are most familiar with the avalanche paths, snow pack, weather, and rescue equipment and minimizing exposure to the avalanche danger areas to the extent possible. Initial and subsequent surveys should be conducted by the same personnel so they can detect changes in the snow pack conditions and snow movements at specific locations.

Typical survey operations are as outlined herein. One vehicle enters the Canyon with one support vehicle either outside the avalanche gates or at the helipad. It is important that the support vehicle not enter the area which can be affected by avalanches at any time during the survey. Each vehicle must contain the required rescue equipment and no more personnel than necessary, two people per vehicle are preferred. This allows the driver to concentrate on the driving conditions and the passenger to concentrate on the avalanche observations. The lead vehicle proceeds up the Canyon, remaining in radio contact with the support vehicle. Location of the lead vehicle is determined by the mile marker posts or the avalanche paths which is communicated via the radio to the support vehicle. If the study plot is accessible, snow tests are carried out and upon completion the lead vehicle returns to the safety zone, following the radio protocol in reverse.

The procedure can vary when the conditions warrant a particular vehicle or machine. With a foot of snow on the highway it is often possible for a four wheel drive to proceed through the Canyon successfully. A more specialized vehicle may be required when snow depths on the roadway exceed a foot: a snow plow, a V-plow, or rotary may be necessary, which is often the case. When using a machine with a single seat (snow machine) it cannot be stressed enough that the operator with the most experience in avalanche terrain be utilized.

If it is determined that snow removal equipment is needed for an initial survey, then the procedure is adapted accordingly. Because the operator will be moving slowly in hazardous terrain, the support vehicle is required to be within as short a distance as is safely possible, preferably within sight distance. This serves two purposes. It enables the support vehicle to act as a spotter where vision permits, as well as being able to provide a more efficient rescue if required. The distance is determined by the proximity of the designated safety zones. Radio protocol shall be adhered to, and if the study plot is accessible the same procedure is maintained.

### 4.3 **Changing Hazards and Closures**

Currently the weather and snow pack conditions are posted each day in the Lowman maintenance shed. The avalanche danger level, based on the standard Five Level Recreational Avalanche Danger Scale modified slightly for the particular needs of Canyon Creek, is also posted. This scale is configured using the probability of human triggered avalanches or naturally occurring avalanches, and provides recommended actions with respect to road closures and back country travel. The avalanche danger scale is as follows.

<b><u>Danger Level and Color</u></b>	<b><u>Probability &amp; Trigger</u></b>	<b><u>Recommended Action</u></b>
Low (green)	natural and human triggered avalanches unlikely	travel generally safe; normal caution
Moderate (yellow)	natural avalanches unlikely; human triggered avalanches possible	use caution on steeper terrain on certain aspects
Considerable (orange)	natural avalanches possible;	be increasingly cautious



	human triggered avalanches probable	on steeper terrain
High (red)	natural and human triggered avalanches likely	travel through not recommended (closure imminent)
Extreme (red, black borders)	widespread natural or human triggered avalanches certain	travel in avalanche terrain should be avoided (road closed)

Times when the hazard rating is changing and the highway is still open or ITD personnel are in the Canyon working pose a great risk to the traveling public and highway personnel. When the posted hazard is most dynamic and has the possibility of moving to high (red), the avalanche team should monitor the Canyon with extra vigilance. Subtle changes and extremes in forecasting avalanches are most challenging to predict. Sometimes these subtle changes occur quickly, with the slightest change in temperature, or a minute change in wind direction. It takes experience to be aware of the changes as they occur and to know how they affect the snow pack and stability within the Canyon.

#### **4.4 Avalanche Control Operations**

Active avalanche control requires the use of explosive charges. Prior to use of explosives in the Canyon Creek area, a justifiable need for explosive use has to be recognized and will require the Lead Forecaster to notify the District 3 Region 2 Engineer. A list of ITD employees authorized to use and handle explosives for control work is provided in Appendix E. Other users may be authorized by the Region 2 Engineer. Any employees handling explosives will be at the discretion of the Lead Forecaster. The highway shall be closed to the public and sweep procedures carried out before operations begin.

ITD will meet all federal and state requirements for the handling, transportation, storage and use of explosives in avalanche control work including but not limited to Federal Aviation Administration (FAA), Federal Department of Transportation, Federal Bureau of Alcohol, Tobacco, and Firearms, and relevant Idaho requirements. Copies of applicable documentation of meeting these requirements will be provided to the Lowman Ranger District on an annual basis.

The caps, fuse and igniters are to be transported separately from the primary explosives. Primary explosives will be transported in accordance with ATF regulations. Explosive transport vehicles will not carry secondary fuel tanks and will be equipped with a spark free bed liner.

Explosives will be stored in the magazines located at the ITD Lowman Maintenance facility. At no time will an ITD employee be in contact with explosive component without attending the currently recognized training as established by the ITD District 3. The Lead Avalanche Forecaster will be issued two (2) keys to the magazines by the Region 2 Engineer. All other keys to the magazines will be retained by the Region 2 Engineer in Boise. The Lead Avalanche Forecaster will be responsible for the daily inventory of explosives in the magazines.

ITD will inform the Lowman Ranger District permit administrator as soon as possible when the use of explosives is anticipated for each control operation. If the permit administrator is not available, ITD will inform Lowman Ranger District office staff of the pending control operations.

During control operations, any unexploded charges will be noted with Global Positioning System coordinates for later retrieval and reported immediately to the Lowman Ranger District permit administrator and the District 3 Region 2 Engineer by the Lead Avalanche Forecaster. All reasonable attempts will be made to retrieve any unexploded charges once it is safe to access the site. In some cases, this may be after the snow melts. Retrieval efforts will be in coordination with the Lowman Ranger District permit administrator.

Ammonium nitrate charges (ANFO) will be prepackaged on non-Forest Service lands. ANFO will not be detonated within 100' of intermittent and 300' of perennial streams in Riparian Conservation Areas (RCAs). Figure 2 shows the RCAs within the Project Area currently identified by the USDA Forest Service.

All pentelite boosters will be double capped to insure detonation. Pentelite charges will be inoculated with a microbial agent to break down the nitrate compounds in the unlikely event of an unexploded and irretrievable ordnance. Pentelite charges may be supplemented with up to 50 pounds of Ammonium nitrate (ANFO)

Storage of fuels and other toxicants or refueling within RCAs will not be authorized unless there are no other alternatives. Storage of fuels and other toxicants or refueling sites within RCAs shall be pre-approved by the Lowman Ranger District and have an approved spill containment plan commensurate with the amount of fuel.

To protect fish from swim bladder effects and egg disturbances, the maximum charge weight near Canyon Creek will conform to the following table (from Wright and Hopky 1998):

<u>Explosive Charge Weight (pounds)</u>	<u>Distance from stream (feet)</u>
0.5	30
1.0	50
2.0	80
5.0	120
10.0	170
25.0	270
100.0	530

Due to the dampening effects of the snow pack some monitoring with sensors should be conducted during explosive work near Canyon creek. This may result in the need to adjust the Wright-Hopky table for winter snow pack blasting. This could allow avalanche

workers to place a slightly larger charge further away from the hazard area, increasing the safety of the workers.

Seasonal tramlines may be installed at areas where they can be removed at the end of avalanche blasting operations each year. Tramlines are a widely used and effective tool in the avalanche industry which allow for a much more effective placement of explosive charges while allowing control team members to stay further away from potential starting zones, greatly increasing their safety.

A reconnaissance flight will be made prior to helicopter operations to determine actual avalanche targets and to determine the presence of specific wildlife. In the event any of the following species are sighted, wolverine, fisher, lynx, wolves, or mountain goats, avalanches will not be triggered that could potentially catch them in the snow and debris flows. Sightings of any of these species shall be reported to the Lowman Ranger District the same day of the observation, so that a biologist has the option of verifying the sighting and monitoring.

The Lowman Ranger District will be afforded the opportunity to monitor activities during the duration of the permit, to insure project activities meet the aforementioned control policies as they pertain to USDA Forest Service standards.

#### **4.4.1 Helicopter Blasting**

A reconnaissance flight will be made to confirm target locations and to insure wildlife species (wolverine, fisher, lynx, wolves, and mountain goats) are not in areas of concern. Helicopter delivery of explosives to avalanche start zones is the prime method of avalanche control for 12 avalanche paths west of the highway near mileposts 99 and 100. However, this control method may be used as needed on other avalanche start zones in the project area. Helicopter operations are scheduled to last approximately 45 minutes per mission; however, actual flight time may vary slightly due to refueling, loading ordnance, and other operational considerations. Helicopters shall be allowed to land briefly 8 times per year to drop off avalanche control team members for the purpose of evaluating fracture line profiles, to obtain a first hand look at the remaining snow in any starting zones and to conduct hand charge mitigation of any remaining avalanche hazard. Control team members will utilize this information to make a final decision as to the safety of the area prior to exposing ITD workers to road clean up operations. A Notice to Airmen (NOTAM) will be requested before each helicopter operation.

If requested, the Forest Service will be given the opportunity to review ITD's helicopter contractor's flight qualifications, fueling sites and spill containment plans.

All ITD employees that will serve as a member of the helibombing crew are required to attend a preflight training from the Contractor that provides that Pilot and aircraft. A list of authorized employees to conduct helicopter work is provided as Appendix F. Others may be granted authorization only by the District 3, Region 2 Engineer. The ground crew will consist of the minimum number of people as needed to conduct the mission.



Missions can typically be conducted with only the assistance of the Primary Ground Support Crew Member (Assistant Avalanche Forecaster). Discretionary Ground Support Members may assist on an as needed basis determined by the Lead Avalanche Forecaster.

### **Preparation of Explosives**

Ammonium nitrate (ANFO) with cast pentelite primers:

The explosives are to be removed from the magazines, quantities logged out, and transported to the helicopter landing site at mile post 95.66 for preparation. The caps, fuse and igniters are to be transported separately from the primary explosives. ANFO is to be proportioned out into appropriate size quantities prior to leaving the ITD Lowman Maintenance yard. Once at the landing site, final assembly may begin with the least number of people that is necessary to complete the process in a timely manner, typically two to three.

- 1) At the ITD Lowman Maintenance yard, set aside the amount of ordnance required.
- 2) Take the containers intended for holding ANFO and inspect for any holes or torn seams and remove any unnecessary material that that may be a hindrance to operations. If containers are compromised in any way, mark and set aside. The breached containers may be utilized at a later date if "double bagging" becomes necessary. Canvas, ITD material sample bags, will be utilized as ANFO containers. They are preferred as they will not produce static electricity, are durable, biodegradable and readily available.
- 3) Measure out and then divide appropriate amount of ammonium nitrate into desired containers. Secure containers for transport to heliport staging area.
- 4) Inspect fuse for any abnormalities that may disrupt the powder train. Nicks, burrs, moisture etc. if identified are to be discarded.
- 5) Measure out lengths with a burn time of no less than 90 seconds (one meter or 39 inches). Allow for elevation as burn time increases with altitude. Sections of fuse are to be cut with an industry standard cutting device only. Failure to do so may lead to a compromised powder train leading to the cap which may cause a dud round.
- 6) Set aside required caps. Secure ordnance in vehicles and transport to heliport site. Note: caps, fuse and igniters to be transported separately from ANFO and Pentelite.
- 7) Inspect inside of caps for any foreign objects. If foreign matter is observed, remove it by pouring it out or gently blowing into cap, taking care not to introduce moisture. Do not attempt to remove any debris by instrument into cap. Do not tap cap with any device or on any surface to remove debris. If unable to remove matter, discard cap and dispose of it in the manner recommended by the manufacturer.
- 8) Insert fuse into cap, making sure that the powder train is flush with cut and that it rests snugly against the end of the primer well. Double crimp the cap onto the fuse using industry standard crimpers only. Prepare enough fuses and caps to double cap each cast primer.

- 9) Inspect each cast primer before lacing. Make sure that the lacing tunnel is free from any obstruction and that the cap wells are both of the required depth, as to allow for the total insertion of cap and that they are free from any obstruction or debris. If obstructions are present, pour out or gently blow into device. Do not attempt to remove by any other method, i.e. cutting, scraping, etc. Doing so may cause premature detonation of ordnance. If irremovable obstructions exist or if cap wells are too shallow, discard and return to manufacturer. If cap wells are longer than the length of cap, simply fully insert cap to the base of well. Do not attempt to shorten cap well by inserting foreign matter.
- 10) Insert fuses through lacing tunnel and snugly into the cap well, taking care not to sharply bend the fuse on the 180 degree turn. A bend or kink in the fuse may cause a disruption in the powder train and then possibly prevent the device from detonating.
- 11) Firmly tape the fuses in place to prevent them from coming loose and then set aside.
- 12) Add the cast primer, making sure that the pentelite is centered amongst the ammonium nitrate.
- 13) Tightly and securely fasten container with duct tape or cord to prevent leaking, taking care to make sure that ordnance is not loose inside bag and that the device will remain intact upon impact with the snow surface. Make sure that both fuses are clearly visible and easily accessed with at least 40 centimeters of fuse protruding from container, then set aside.

## **Personnel**

### **Pilot Responsibilities:**

The Pilot is in charge of the safe operation of the helicopter. It shall be the Pilot's responsibility to evaluate and determine the safety of the mission. Weather conditions or mechanical difficulties may result in canceling or rescheduling the mission. The Pilot will be required to maintain communications with ground personnel. The Pilot and aircraft will be provided by a Contractor.

### **Bombardier Responsibilities:**

The Bombardier rides in the seat behind the pilot. The Bombardier is an extra set of eyes for the pilot for the appropriate positioning of the craft. This is to assure proper placement of charges to the "start zone" targets. Additional duties include the safe ignition and discharge of the charges.

Under no circumstances shall the release of the charge be from behind or above the seat position or released under the craft, out of the pilot's view. The Bombardier may jettison the charge if a malfunction is suspected; the Pilot must be informed of any such action.

## **Procedures**

- 1) The pilot removes a rear door from the helicopter and provides a harness for the Bombardier. The right rear door is preferred as it affords the pilot and the bombardier the same view.



- 2) The pilot ensures that the intercom and radio is functioning correctly. It is imperative that there is direct communication between the Bombardier, pilot and ground personnel. The specific radio frequencies provided to the ITD by the FCC for communication within the Department will be used and required in the Helibombing Contract.
- 3) Explosives and personnel are loaded into the helicopter. Explosives are transported in a container in the helicopter that is secure but where the explosives are capable of being easily jettisoned. The container shall not have any internal exposed metal. Place pull wire igniters in a waterproof container separate from the primers.
- 4) Bombardier sports a safety harness that is attached to the helicopter as well as a seatbelt. The safety harness should have a clasp preventing accidental release. All other personnel should have securely fastened seatbelts.
- 5) A dry run is carried out on the ground to ensure that the intercom, radio, stopwatch and recording system are all in place and functioning. This allows for all personnel to comprehend their respective duties.
- 6) The craft then proceeds to the target sites and a visual sweep is carried out to make sure that the area is free of any people or animals. This also allows for an aerial view of avalanche start zones for confirmation of selected targets.
- 7) The Bombardier directs the pilot to the starting zone targets.
- 8) The Bombardier trims fuses with appropriate tool and snugly attaches the pull wire igniters to the fuses.
- 9) Bombardier ignites charges directing strikers out the open door of the craft to avoid sparks inside the helicopter.
- 10) Bombardier drops the charge toward the slope, down and away from the helicopter. The charges are dropped only when the helicopter is in hover or slow flight.
- 11) Helicopter retreats to a safe observation distance to observe results. After detonation, return to sites and record all pertinent results in the blasters log.  
  
Misfires shall be recorded with a GPS latitude and longitude location and misfire detonation should be carried out by repeating steps 8 through 11, placing another charge as close as possible to the dud.
- 12) Move to next target areas and repeat as necessary.
- 13) Once the mission has been completed, the craft returns to the landing zone and briefs the ground crew on the mission results.

#### **4.4.2 Avalauncher**

The Avalauncher is a portable explosive delivery system that utilizes a nitrogen gas propellant for the delivery of Pentelite charges to avalanche start zones. The avalauncher will be used to deliver explosives to the avalanche start zones at 96.86, 96.88, and 96.92. Operations will be under the direct supervision of the Lead Avalanche Forecaster. The avalauncher is to be operated by two but no more than three personnel. Snow removal crews are to restrict their activities to be no closer to the operation than the position of the spotter. The spotter will be positioned to prevent inadvertent entry into the avalanche run

out zone and will be in direct communications with the Lead Avalanche Forecaster throughout the operation. For security reasons, the avalauncher will be transported from the Lowman Maintenance yard to the site for use and upon completion returned to the Lowman Maintenance yard. The avalauncher will be fired from a stable, semi-permanent platform that will be constructed at the mile marker 97.05 pullout. This will allow accurate "all weather" firing into avalanche start zones once correct elevation and tranverse angles are established.

Additional avalauncher locations will continue to be evaluated. Specific locations where the avalauncher could be mounted or transported and fired from a truck or trailer will be provided to the Lowman Ranger District for approval. These sights will specify the paths to be shot from each location and the method of positioning the gun with a marker to indicate how far forward to park and a compass heading to exactly orient the truck or trailer.

### **Personnel**

The Lead Avalanche Forecaster shall have the responsibility of maintenance and operation of the avalauncher. While in use, the duties shall include supervising the set up, targeting and firing. With experience and confidence in trained personnel, these duties may be delegated at his discretion. The avalauncher will be maintained and operated in accordance with the manufacturer's recommendations.

#### **Gunner Responsibilities – Lead Avalanche Forecaster:**

- Safety of the entire operation
- Transportation of the explosives
- Requesting a NOTAM to pilots
- Ensuring that the area closure is complete
- Setting and checking the required pressures, elevations, and angles
- Handling the safety lever pressure release valve
- Firing the projectile

#### **Assistant Responsibilities:**

- Transporting the equipment
- Handling the nitrogen cylinders
- Handling the barrel extension
- Loading the projectiles
- Removing the cotter keys and safety pins
- Visually checking that the area is clear
- Recording observations and avalauncher settings for each path targeted.

### **Explosives Preparation**

The nitrogen cylinders should be checked for leaks or abnormalities prior to transport to Avalauncher site.

The prepackaged ordnances are to be removed from the magazine and transported to the operation site. The caps are to be transported separately from the pentelite.

- 1) Set aside amount of ordnance required
- 2) Set aside amount of caps required
- 3) Inspect the inside of caps for any abnormalities or foreign debris that could compromise detonation. If said material is discovered, remove by pouring out or gently blowing, taking care not to introduce any moisture to the cap. If unable to remove material, set aside to be disposed of later by proper authority. Do not attempt to remove debris by inserting any object into or tapping the cap.
- 4) Unpack the required number of projectiles and inspect them for any abnormalities. Looking for any damage or distortion in the body of the projectile. Check to make sure that the "cap well" is both straight and deep enough to accept the cap. Any projectile that gives cause for concern should be rejected and set aside for disposal.
- 5) Unpack the required number of tailfin assemblies
- 6) Check that the components of the tailfins are all in conformance with the intended design. Make sure the pressure plate is tight. Affirm that the striker is against the magnet. Make sure that the wire, cotter key, primer and pins are all in their correct positions and are in acceptable working order. Assume that any deviation from the intended design of the equipment is just cause for rejection.
- 7) Projectiles should only be assembled and primed prior to their actual use, at the avalauncher shoot site.
- 8) Place cap on primer
- 9) Place tailfin assembly on projectile. Check to verify tailfin assembly is securely affixed. On rare occasions, apply tape to the male end.

### **Avalauncher Preparation**

- 1) Ensure the safety valve is in the closed position and secure the avalauncher on the stationary platform.
- 2) Ensure that the gun is free of obstructions
- 3) Ensure supply hose valves are closed
- 4) Attach the gas supply hose to the nitrogen cylinder
- 5) Check the level of test pressure in the gun
- 6) Check the gun for changes in pressure level. **Do not proceed further unless gas pressure level in the avalauncher has stabilized.**
- 7) Secure barrel extension to avalauncher
- 8) Contact spotter, via radio, to confirm area clear
- 9) Set pressure to 50psi

- 10) Open safety valve
- 11) Open fire valve
- 12) Pressurize avalauncher
- 13) Position toward target
- 14) Set elevation and defection
- 15) Place projectile in chamber and remove safety pin
- 16) Close and lock chamber – Avalauncher is now ready to fire
- 17) Operation of the avalauncher will be in accordance with the manufacture's operating procedures.

#### **4.4.3 Hand Placed Charges**

##### **Case Charging**

There are two locations where case charging is the primary control method, milepost 104.28 and 104.42. The two cut banks are often the earliest responders to loading and cross loading which result in a high frequency of slab avalanching. Their width and length adjacent to the highway lend themselves to being more of an immediate threat, but readily accessible. The milepost 97.4 area and other cut banks may also be controlled using pentelite case charging. Given the proximity of these cut bank areas with Canyon Creek, the case charges will consist of pentelite charges with det cord and cap and fuse. Fuse length may require adjustment but initial lengths shall be no less than three minutes. Pentelite charge weights shall conform to the setbacks defined in 4.4 Avalanche Control Operations. No ammonium nitrate products will be used at these locations.

##### **Personnel**

The Lead Avalanche Forecaster will assume the role of Blaster. The Lead Forecaster will designate the Assistant Blaster / Spotter and shall thoroughly outline their respective duties. The Assistant may, at the direction of the Lead Forecaster, assist with case charge preparations, place case charges and / or fill the role of Spotter. All personnel are to maintain contact via hand held radios.

##### **Blaster Responsibilities – Lead Avalanche Forecaster:**

- Conduct a pre-job safety briefing with the crew.
- Preparation, placement and detonation of explosives
- Placement of spotter
- Ensuring the area closure is complete
- Recording observations, including pre-blast details and the results of the post-blast site inspection, in a blasting log. The blasting log must be kept available for inspection at all times.

##### **Assistant Blaster / Spotter Responsibilities;**

- Assist with explosive preparation.
- Under the direction of the Blaster place case charges.



- As a Spotter will be positioned at an appropriate observation point and by radio notify the Blaster of any snow slab movement or avalanche activity. And as a Spotter would prevent any one from entering the area and to be the initial responder for rescue if needed.

## **Procedure**

Prior to each season, the Blaster or his designee will inspect each potential case charge location. Objects that could be dislodged by explosive control or avalanche activity, may be obscured by snow when control work is done, are identified and either removed in advance of operations or marked in such a manner that would be recognized when snow is present, i.e. red ribbon on tree limb, snow pole, etc. This is to provide indicators for potential debris that may be hidden in the snow when rotary snow removal operations begin.

- 1) Explosives are removed from the magazine and transported to the target area. Caps and fuses are to be transported separately from the pentelite.
- 2) Explosives are to be prepared, caps and timed fuse attached, at the last most practical moment outside the avalanche area.
- 3) Spotter is placed at the 104 safety dot, or as directed, with an adequate signal device, (hand held air horn or comparable), and radio outside the blast and avalanche areas to advise the blaster of any snow movement activity.
- 4) If available have a Rotary standing by at the 104 safety dot location for immediate snow removal.
- 5) Place the explosives in the desired locations. The charges should be placed on the outside of the snow bank facing the snow pack to be stabilized. All charges must conform to the setbacks defined in 4.4 Avalanche Control Operations.
- 6) Prime the explosives. Notify the Spotter that the system is now primed.
- 7) Freshly trim the fuses immediately prior to attachment of the pull wire igniters.
- 8) Initiate the igniters, ensure that they are burning and then immediately leave the danger zone.
- 9) After detonation, check to verify for desired results and record in the Blasters Log.
- 10) Notify the rotary operator that the blasting has been complete and snow removal may begin.

## **Safety**

- The crew must be equipped with radios, adequate warning device, (hand held air horn or comparable), and avalanche search and rescue equipment. They must be trained in current search and rescue techniques.
- Case charging should only be applied to relatively accessible short slopes.
- The case charge detonation location should be at one end of the avalanche path to ensure adequate time for the blaster to vacate the danger zone.



- All personnel must be out of the blast area by the one minute mark of the remaining lit fuse time.
- After detonation of charges, any unused explosives will be returned to the magazines.
- Estimated travel time to safety may require additional safety fuse for a safe exodus.
- No flammable/sparking materials may be carried in the same packs/containers as the explosives or fuse assemblies.

### **Hand Charging**

Hand charging may be used in lieu of other methods for avalanche control when time and access are available. There are applications where hand charging is the most efficient and feasible control method. These include the detonation of any unexploded ordnance, cornices, as well as accessible start-zones such as 96.05 to 96.50 (specifically 96.28) and start-zones that may not be accessed via helicopter due to no fly days. Areas identified as Primary Targets in Figure 2 are potential areas for hand charging. Hand charges may be ANFO or pentelite charges.

The disadvantage of hand charging is the explosives have to be manually carried into position and placed in the start zones. This technique takes longer to position than helicopter bombing and the use of an avalauncher. However, in periods of high instability and foul weather, hand charging could be utilized in the lower end of the Canyon in conjunction with the avalauncher to expedite control operations. Other potential situations result from wind loading of an isolated path that would not warrant the expense of air delivery.

### **Personnel**

As with case charging, the Lead Avalanche Forecaster shall assume the role of Blaster. The Forecaster will designate the Assistant Blaster / Spotter and shall thoroughly outline their respective duties. The Assistant may, at the direction of the Lead Forecaster, assist with hand charge preparations, place charges and / or fill the role of Spotter. All personnel are to maintain contact via hand held radios.

#### **Blaster Responsibilities – Lead Avalanche Forecaster:**

- The safety of the entire operation.
- Conducting a pre mission briefing with the crew.
- Placement of Spotter
- Ensuring areas closure is complete
- The safe and correct preparation of the explosives.
- Timing the fuse from ignition to detonation
- Transportation of the explosives to the start zones.
- Accessing the safest route to the start zones.
- The placement and the detonation of the explosives.

#### **Assistant Blaster / Spotter Responsibilities:**

- Transportation of the explosives to the start zones.
- Belaying the blaster or acting as a spotter for the blaster when needed.
- Documenting detonation and blasting log.

### **Procedure**

- 1) The explosives are removed from the magazines and prepared and transported. Caps and fuses are to be transported separately from the pentelite.
- 2) Personnel, as directed by the Lead Forecaster, to proceed to pre-designated hand charge routes.
- 3) Charges should be removed from packs only when ready for placement.
- 4) The Blaster positions themselves in a position from which to toss the hand charge, with planned retreat path, while other team members observe from a safe position, well removed from the edge of the slope.
- 5) Check to make sure the area is clear, visually down path and by radio with spotter on roadway
- 6) When the Blaster is in position, approximately 2 centimeters of fuse should be clipped off to provide a fresh powder train.
- 7) *Only* when the Blaster is in position should the pull wire igniter be placed on the fuse; then the igniter may be pulled to initiate the fuses.
- 8) Trail the ends of the fuses in the snow to ensure they are burning, (telltale blackening of the surface), hold the charge up and wait for the igniters to droop on the fuses, confirm visually then toss onto the slope using an underarm action.
- 9) Announce over the radio, "fire in the hole". All members of the team should move to an area a safe distance from the slope and the burning explosive.
- 10) If a dud occurs, the time, location and personnel involved should be noted. The area should be closed to entry for at least one half hour before a search commences, snow stability considered. If conditions make it impractical or dangerous to retrieve a dud promptly, place a second charge as close to the dud as possible, following steps 3 through 9. Remove yourself to safe position and await detonation. Following the detonation, return to the site to confirm that all explosive materials have been destroyed. Dud rates are anticipated to be less than 0.2%.

## **5.0 AVALANCHE SEARCH AND RESCUE PLAN**

The operations described in this plan are not intended to be prescriptive or definitive. Appendix C contains additional rescue plan information. The essence of avalanche rescue is operational flexibility in responding to changing conditions. Strategies devised to deal with particular situations depend on such variable factors as manpower availability, weather conditions, and stability of the snow pack. Cooperation and

coordination among several agencies, public and/or private are often necessary. These ideas are based on, but not limited to rescue procedures listed in the Department of Agriculture, U.S.F.S. Handbook 489, and the National Avalanche School Handbook, 1991.

Factors that limit the rescue options and could reduce the reaction time of a rescue include the remoteness of the Canyon Creek area, and its accessibility. The southern gate is 20 miles from Lowman, and the northern gate is 25 miles from Stanley, with 10 miles of roadway within the known avalanche area. With high number of known avalanche chutes there is the probability of someone becoming trapped either in or between two avalanches midway through the canyon. The response time can differ depending on whether there is a known victim versus if it is unknown if there is a victim.

## **5.1 Primary Response**

The existence of an avalanche problem is often an on-site discovery by ITD personnel or notification by the traveling public to state or federal authorities. Idaho Code, section 46-1009, provides for the Boise County Sheriff having jurisdiction and responsibility for search and rescue including avalanche rescue. Maps indicating staging areas, ITD emergency caches, closure gates, and current ITD contact lists are available.

It is strongly urged that any law enforcement or emergency services personnel entering the segment between avalanche closure gates during times of changing avalanche danger have attended an avalanche awareness workshop and be equipped for self rescue. Partner agencies are invited to attend the annual ITD avalanche safety training.

All ITD personnel working in the Canyon Creek area during the avalanche season shall have annual training and review of avalanche safety, personal safety equipment, and self rescue. All employees shall wear the appropriate safety gear and clothing including an avalanche rescue transceiver during the avalanche season. Regular transceiver practices are to be conducted. Appropriate personal safety equipment will be carried in each ITD vehicle and is the responsibility of the vehicle's driver.

The first ITD or law enforcement person alerted and on scene becomes the general alarm person. Some general guidelines to be followed during the primary response are:

- 1) Hold the witness if there is one.
- 2) Sound general alarm – contact ITD District 3 and State Communications by radio or telephone. State Communications to follow road closure procedures and make notifications to other agencies if necessary.
- 3) Initiates road closure and can request additional personnel to assist.
- 4) The general alarm person becomes rescue leader until relieved by a superior (in search and rescue training and/or experience). A checklist of the current avalanche rescue plan and duties of the rescue leader should be in all District 3 and District 4 vehicles, sheds, rescue caches, and available to the Lowman Ambulance and rescue personnel. Some of the rescue leader's duties include:

- maintain communications
  - start procedures for road closure with assistance from District 4, (Stanley)
  - evaluates potential for more avalanches and assesses avalanche danger
  - may initiate a hasty search, only if person/vehicle is known to be trapped
  - keep track of anyone entering closed avalanche hazard area and prevents unauthorized personnel from entering area
  - decide on a safe area to temporarily stage from ( heliport site, safety zones or outside avalanche gates )
  - conduct a check on vehicle counter to confirm system is working properly
    - check for tire tracks
  - if going in to clear slides, remind personnel to remain inside vehicles
- 5) ITD personnel, (Lowman lead worker or Idaho City foreman), will check the vehicle counter and communicate information to the rescue leader.

## **5.2 Secondary Response**

The second wave of rescue workers will be ITD workers and Boise County Sheriff personnel. They will be notified by District 3 and/or State Communications at the request of the on-site rescue leader. Due to the response time from Boise, Idaho City, or Stanley, it is recommended to alert people and call for rescue personnel immediately. They can always be turned back if not needed.

## **5.3 Tertiary Response**

The third wave of rescue workers would come out of Boise, and may include Idaho Mountain Search and Rescue and/or other concerned agencies. Again, they should be immediately notified upon an avalanche accident and put on stand-by or start in route to the scene due to the extended travel time.



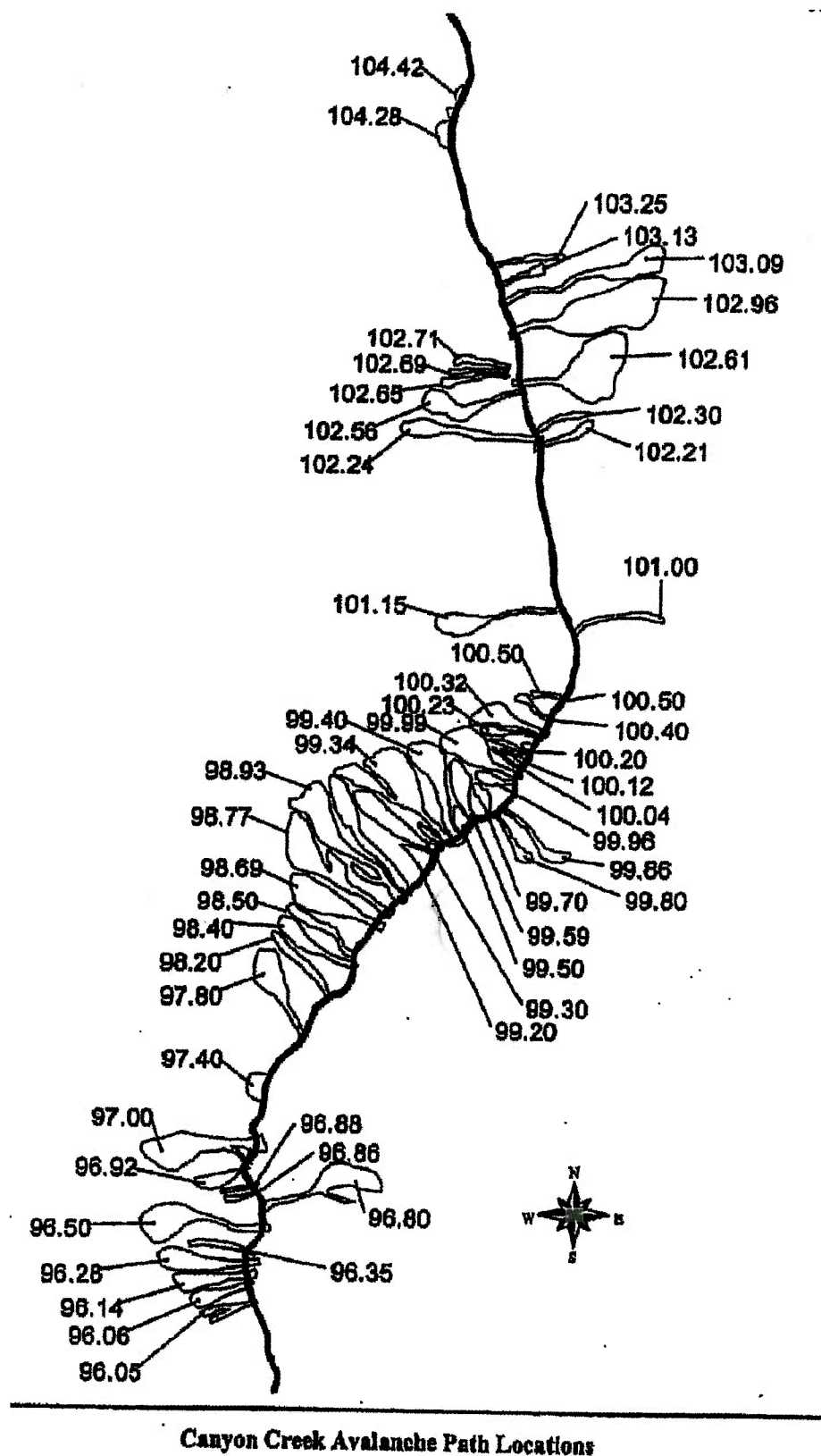
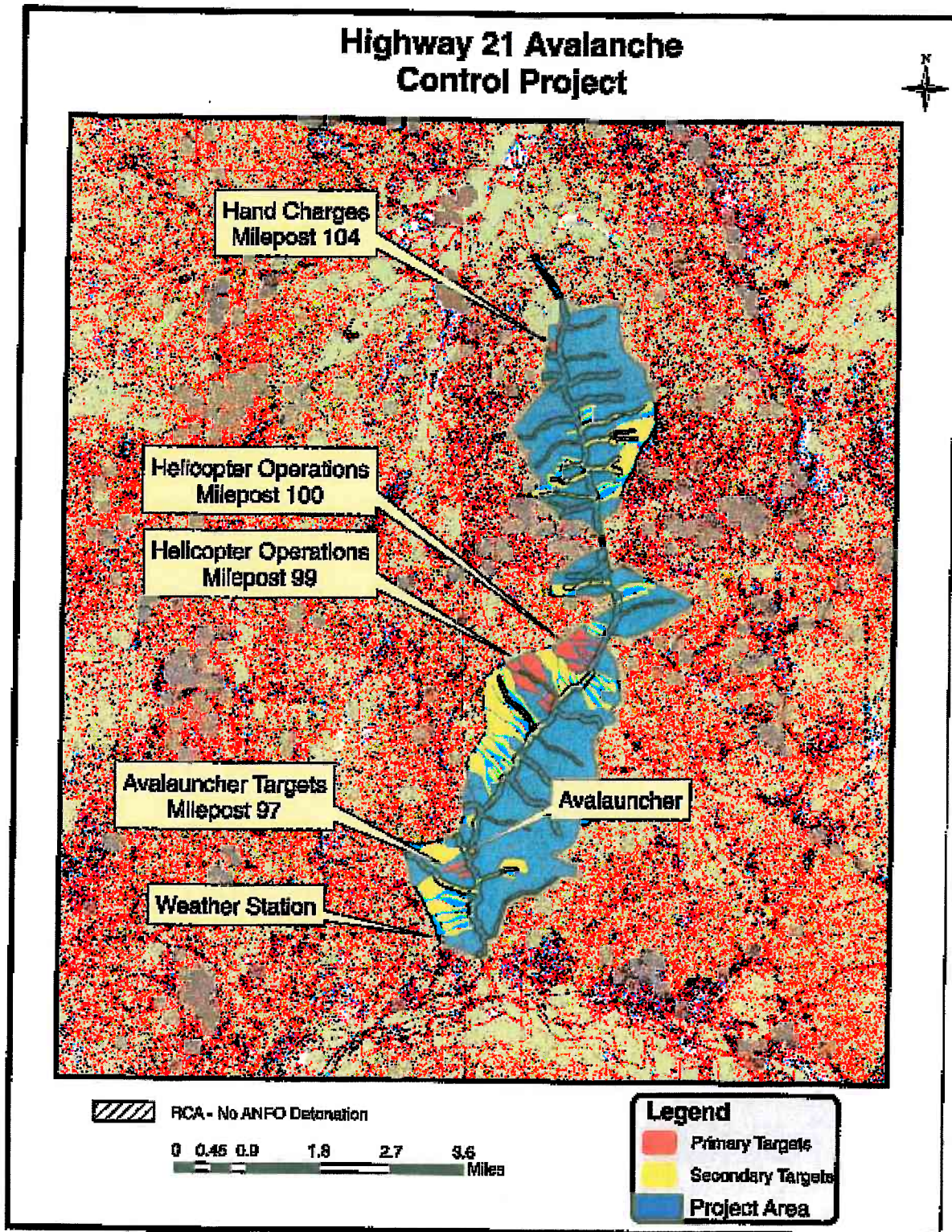


Figure 1

Figure 2: SH-21 Avalanche Control Project Map





## **SH-21 SUPPLEMENTAL OPERATING PROCEDURE**

### **CANYON CREEK AVALANCHE ROAD CLOSURE MP 93.8 TO MP 105.5**

#### **PURPOSE:**

This supplemental establishes additional procedures for closure and subsequent reopening of portions of SH-21 within Section 4-1 due to avalanche conditions in Canyon Creek – MP 93.8 to 105.5.

#### **PROCEDURE:**

When it becomes apparent that a SH-21 road closure or opening is forthcoming, action shall be taken in the following order:

- State Communications will initiate documentation of the closure, date, time, reason for closure, requesting party for the closure, and times of notifications through the dispatch system.
  - Prior to closure or opening, the status of the road section shall be verified with Cecil Dallman, Idaho City Foreman - or Bob Frisbee, Lowman Maintenance Lead worker, and recorded.
  - The dynamic message signs shall be changed to reflect the roadway condition. State Communications will activate the Dynamic Messages Signs and log changes in the dispatch system. The signs will be activated with the standard messages shown in Appendix G, Standard DMS Messages. If the signs can not be activated by State Communications, State Communications will notify District 3 to activate the signs. Contact persons to activate the signs are listed below on the Notification List below. District 3 will attempt to turn the signs on with the remote wireless communication system and if that fails, will contact the appropriate Maintenance Foreman to place portable message signs at each DMS location.
  - Individuals and agencies on the Avalanche Notification list shall be notified of the route status.
  - State Communications will initiate a closure or reopen notice through the 511 Traffic Alert System. The District Maintenance Manager will ensure that the 511 notices are initiated.

## **SH-21 "CANYON CREEK" NOTIFICATION LIST**

PLEASE VERIFY ROUTE STATUS WITH ONE OF THE FOLLOWING:

NAME	WORK PHONE	HOME PHONE
<b>Cecil Dallman (#390)</b> Idaho City/Lowman Foreman	392-6628	392-9646
<b>Bob Frisbee (#390-1)</b> Lowman Mtce Lead worker	259-3311	259-3741

PLEASE USE APPENDIX G, STANDARD DMS MESSAGES FOR ADVANCED NOTICE CLOSURE OR OPEN MESSAGES:

DYNAMIC MESSAGE SIGNS		
<b>SH-21</b> at Boise, Idaho City, Lowman, & Stanley		
<b>Banks-Lowman</b> at Banks		
<b>SH-55</b> at Shadow Valley		
<b>IF SIGNS FAIL TO ACTIVATE, CONTACT THE FOLLOWING DISTRICT 3 EMPLOYEES TO MANUAL OR REMOTE ACTIVATE</b>		
NAME	WORK PHONE	HOME PHONE
<b>Dan Bryant</b> , D3 Mtc Manager If no answer then call	334-8348 or cell 608-3264	793-2568
<b>Jim Morrison</b> , D3 Construction Manager	332-7191 or cell 830-3615	

PLEASE NOTIFY THE FOLLOWING PEOPLE:

NAME	WORK PHONE	HOME PHONE
<b>Cecil Dallman (#390)</b> , Id.City-Lowman Foreman	392-6628	392-9646
<b>Bob Frisbee (#390-1)</b> , Lowman Lead worker	259-3311	259-3741
<b>ISP Dispatch</b>	846-7500	



<b>Steve Miller</b> , Boise Maintenance Foreman	334-8361, 830-3622 cell	343-7187
<b>Dan Davis</b> , Banks Maintenance Foreman	830-6492, Cell 630-4204	382-4309
NAME	WORK PHONE	HOME PHONE
<b>Dan Bryant(#305)</b> , D3 Mtce Mgr if not Dan then	334-8348 or cell 608-3264	793-2568
<b>Tom Points</b> , D3 Regional Engineer if not Tom then	334-8933 or cell 830-8679	585-2517
<b>Dave Kuisti</b> , D3 ADE(Operations) if not Dave then	334-8302 or cell 272-0547	468-7992
<b>Dave Jones</b> , D3 District Engineer NOTE: First person in this block to receive the call from State Communications, will email the rest of the group and Mollie McCarty at Office of Communication.	334-8301 cell 830-3601	
<b>Larry Jokinen (#484)</b> , Stanley Lead worker if not Larry then	774-3581	774-3574
<b>Ron Robinson (#480)</b> , Hailey/Stamley Foreman if not Ron then	788-3365 or cell 731-1480	788-0838
<b>Gary Cvecich (#485)</b> , Stanley Mtce if not Gary then	774-3581	774-3609
<b>Andy Gunderson (#483)</b> , Stanley Mtce if not Andy then	774-3581	774-3512
<b>District 4</b>	886-7800	
<b>ASK TO TURN SIGNS AT JCT US-93/SH-75</b>	879-4425	879-2762
<b>Lamont Taylor (#662)</b> , Challis Lead worker if not Lamont then	756-3313	
<b>Robert Taylor</b> , Salmon Lead worker if not Robert then	756-3313 cell 303-1010	756-2979
<b>Bill Vermaas (#660)</b> , Salmon-Challis Foreman		
<b>CONFIRM SIGNS CHANGED &amp; LOG TIME</b>		
Call 334-8805 (334-8229 backup) <b>Bryan Smith</b> – Emergency Program Suprv. or <b>Louie Albright</b> – Emergency Program Coord.	334-8414  332-2021	938-8747  939-8340
Notify the following people with the Automated Traffic Alert System (511):		
<b>Mollie McCarty</b> , ITD Public Affairs <a href="mailto:Mollie.McCarty@itd.idaho.gov">Mollie.McCarty@itd.idaho.gov</a>	334-8005	
<b>City of Stanley</b> <a href="mailto:hstauts@ruralnetwork.net">hstauts@ruralnetwork.net</a> <a href="mailto:cityclerk@ruralnetwork.net">cityclerk@ruralnetwork.net</a> <a href="mailto:deputyclerk@ruralnetwork.net">deputyclerk@ruralnetwork.net</a> <a href="mailto:stanleypd@ruralnetwork.net">stanleypd@ruralnetwork.net</a>	830-6492	

<b>Lowman Ranger District</b> <b>nbosworth@fs.fed.us</b> <b>hdoty@fs.fed.us</b> <b>cwagner@fs.fed.us</b>	259-3361	
<b>Stanley Ranger District</b> <a href="mailto:jborton@fs.fed.us">jborton@fs.fed.us</a> <a href="mailto:ericaellison@fs.fed.us">ericaellison@fs.fed.us</a>	774-3000	

## Appendix B – Safety Equipment Inventory Lists

### Required Individual Safety Equipment:

- 1 avalanche transceiver
- 1 avalanche shovel
- 1 collapsible avalanche probe

### ITD Mobile Avalanche Cache:

- 4 avalanche shovels
- 4 collapsible avalanche probes
- 1 guidon cord

### Recommended Individual Items:

- Additional clothing and gloves
- Food
- Flashlight and batteries
- Matches or lighter
- Hand held radio with additional batteries

### Each ITD Fixed Rescue Caches is to contain:

- 4 – MREs (meals ready to eat)
- 1 – cook stove
- 1 set - cook stove fuel tablets
- 5 – candles
- 1 – cook set with utensils
- 1 – box waterproof matches
- 1 – first aid kit
- 5 – fuses
- 1 – fire extinguisher
- 1 – 100' rope
- 1 – hatchet
- 1 – shovel
- 1 – sleeping bag
- 1 – wool blanket
- 3 – space blankets
- 1 – 8'x 8' tarp
- 3 – 1/2" x 12' probes (1/2" rigid conduit)

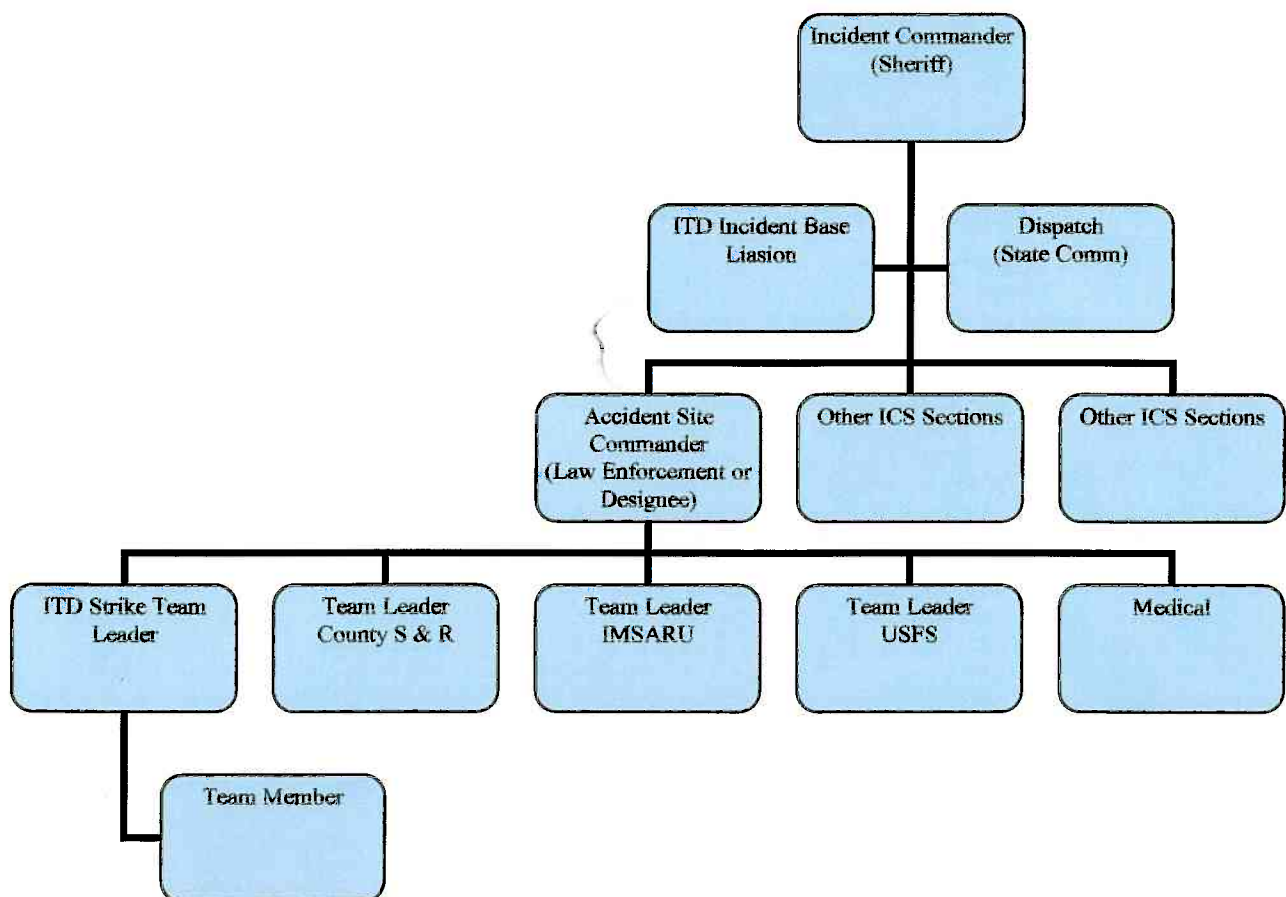
## Appendix C

### ITD SH-21 HIGHWAY SNOW AVALANCHE INITIAL RESPONSE RESCUE PLAN

Pursuant to Section 46-1009, Idaho Code, providing that the Sheriff of each county shall be the official responsible for command of all search and rescue operations within his jurisdiction.

This document is a supporting document to the County Sheriff's prescribed search and rescue plan. This document describes ITD initial response to a highway snow avalanche and resources to assist with such. It does not describe additional agencies responsibilities.

ITD's role based on their likelihood of being the first-report receiving party or reporting party during normal operational hours is that of INITIAL STRIKE TEAM until relieved by the Accident Site or Incident Commander. ITD's responsibility for operation of the highway also includes the role of BASE LIASION. These are both defined as part of the INCIDENT COMMAND SYSTEM.



Example ICS organization of Highway Avalanche Incident.



**If avalanche is report to you:**

1. Hold the witness
2. Record information
  - a. Name and contact information of witness.
  - b. Could they see over the debris?
  - c. The specific nature and location of incident.
  - d. The date and time of the specific event.
  - e. Facts known – vehicles involved, numbers.
  - f. Physical description of site – runs to creek.
  - g. The weather conditions at the scene.
  - h. Time of report
  - i. Reporting party location
3. Notify State Comm with the above required information.

**ITD INITIAL RESPONSE PROTOCOL**

**Size Up**

- Look Up, Look Down, Look All Around
- Scene Safety – Work in Tandem
- Refer to Rescue Checklist Cards
- Assess additional overhead exposure/reloading conditions
- Establish escape route – 3 horn blasts
- Position avalanche guard (Tandem/Back Up) in safe location with view of debris
- Park in safe location at incident

**Primary Search**

- Determination of Probable Search Area (Primary/Secondary)
- Question the Witness for information
- Establish Point Last Seen (PLS), and direction of travel
- How many subjects/vehicles?
- Visually search the entire debris zone, including the perimeter for clues. Investigate visible clues.
- Audio search for subjects making any type of sound/noise. Shout/listen.
- Provide medical assistance if required.
- Transceiver search for any transmitting devices.
- Rapid probe likely catchments.
- Work search dogs as soon as possible (if available).
- Mark all clues, and outline of the debris zone (resource permitting).
- Return all rescuer beacons to transmit when transceiver search is complete.
- Avoid contamination of the search area with exhaust/gasoline fumes.

## **Secondary Search**

- Coarse probe the primary search area (Open/Closed position per resources)
- Sketch or GPS site, mark all probe line boundaries.
- Dig out all suspect strikes.
- Repeat coarse probe to primary search areas (stagger positions)
- Expand coarse probe to secondary search areas
- Take periodic breaks for food/drink.
- When coarse probing is completed with negative results, and as additional resources arrive on-site, fine probing the primary search area may begin

## **Extrication**

- With TLC, clear/uncover the head, face, and chest first
- Excavate carefully around the subject
- Notify base operations with subject status

## **Follow Up Phase**

- All rescue members are accounted for and returned to base
- Debriefing to members
- Acknowledgements
- Account for all pieces and parts, including gear and equipment
- Return equipment to cache
- Paperwork/reports

## **ITD ICS AVALANCHE RESCUE JOB DESCRIPTIONS**

### **ITD INCIDENT BASE LIASION**

- Establish operations base (dial up phone)
- Begin log of events, rescue personnel, and agencies responding to incident
- Delegate duties to assist with base operations
- Assign or be local dispatcher to maintain communications to all teams at the site
- Maintain record of all teams dispatched to the site
- Arrange ITD support resources as required
- Arrange for Back-up ITD resources
- Maintain communications with outside resources/agencies
- Arrange for transport and medical care to victims if no law enforcement is on scene
- Arrange for debriefing of ITD personnel
- Ensure that all ITD personnel safely return from incident site
- Account for all ITD equipment/gear utilized in the field, and return to the cache
- Complete mission reports and file

### **ITD STRIKE TEAM LEADER**

- Initial hazard assessment – scene safe
- Communications with dispatch of events
- GPS or sketch scene with all clues marked
- Perform the role of site commander until relieved
- Ensure safety of all team members
- Establish a safe access route to the scene – identify with wands
- Establish a safe staging area
- Establish an escape route and safety watch if required
- Establish point of entry, point last seen (PLS), or other tangible events with witness
- Ensure good communications of-site
- Conduct rapid search of the entire area including perimeters, identify and mark all suspected clues
- Maintain communications with base operations
- Ensure the team members return safely from the field

## **TEAM MEMBER**

- Be properly equipped at the site to sustain efforts
- Coordinate/report directly to team leader
- Maintain good hydration and energy through the operational period
- Communicate and behave in a professional manner
- Conduct the physical searching

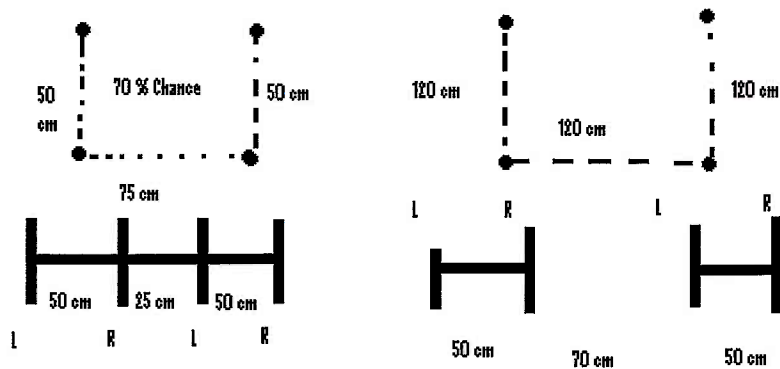
## **PROBING METHODS**

### **Selective Probing**

- Rapid, but systematic search of the avalanche debris with the highest probability of detection
- Selective probing in catchments

### **Course Probing for Individuals**

- Probe spacing of 75 cm (30 inch) X 70 cm (28 inch), with the line advancing a full step forward
- First pass will generate approximately 70% probability of detection
- Mark all boundaries of probed areas



### Course Probing for Vehicles

- Probe spacing of 120 cm (48 inch) X 120 cm (48 inch), with the line advancing a full step forward
- Mark all boundaries of probed areas, sketch or GPS



#### Appendix D: Instructions for using forecast models

1. Banner Summit precipitation amounts are estimated to be 60% of precipitation amounts at 8400'.
2. If two storms are back to back, consider as one storm unless there is a 24 hour break with no new precipitation.
3. If avalanches begin to run in spite of avalanche forecast, close highway.
4. Driver experience is based on previous experience, such as how does the driver feel about this particular storm, snow pack, and weather in regard to the timing of avalanche activity.
5. Records of weather and avalanche activity are important to evaluate models for adjustments to inputs.
6. Snow pack ram number will give information on snow strength which will affect depth of slab release, therefore amount of snow involved. These should be done approximately every 10 days at Banner Summit when weather is good and snow stable.
7. Bridge top wind velocity is estimated by snow plumes and gusting in valley bottom.

#### Model #1

Forecasting for dry snow avalanche (less than .8 inches of water)

Below freezing temperatures > = greater than, < = less than, wx = weather

Water content for 12 hour intervals at Banner Summit	
Inches of water	Index #
> .8	4
.6 - .7	3
.4 - .5	2
< .3	

Wind (ridge tops)	
> 30 mph	3
< 30 mph	1

24 hour wx forecast for ridge top winds	
> 30 mph	2
< 30 mph	1

24 hour wx forecast for new snow (8400')	
7" - 12"	3
2" - 6"	2

1"	1
----	---

Snow pack ram # (average of bottom 30 cm)	
0 – 5	5
5 – 10	3
10 – 20	2
20	1

Driver experience; avalanche will run in	
1 hour	3
5 or more hours	1

Index totals / Action called for	
20 – 15	Close highway now
14 – 12	1 hour
11 – 10	3 hours
9	5 hours
8 - 6	ok for 10 hours

## Model #2

Forecasting for dry snow avalanches (more than .8 inches of water)

Water content for 12 hour intervals at Banner Summit	
Inches of water	Index #
> 1.5	7
1.2 – 1.4	5
1.0 – 1.1	3
.8 - .9	2

Wind (ridge tops)	
> 30 mph	3
< 30 mph	2

24 hour wx forecast for ridge top winds	
> 30 mph	2
< 30 mph	1

24 hour wx forecast for new snow (8400')	
7" – 12"	4
2" – 6"	3
1"	1

Snow pack ram # (average of bottom 30 cm)	
0 – 5	6
5 – 10	5
10 – 20	2
> 20	1

Driver experience; avalanche will run in	
1 hour	3
5 or more hours	1

Index totals / Action called for	
20 – 15	Close highway now
14 – 12	1 hour
11 – 10	3 hours
9	5 hours
8 - 6	ok for 10 hours

### Model #3

Forecasting for rain induced avalanches (rain on dry snow pack or snow turns to rain)

Inches of new snow at Banner Summit past 24 hours	
> 12"	6
12" – 8"	5
7" – 5"	4
< 4"	4

Rain Intensity	
> .1" per hour	4
< .1" per hour	2

wx forecast	
Warm temps to continue	2
Cooling trend	1

Snow pack ram # (average of bottom 30 cm)	
0 – 5	2
5 – 10	2
10 – 20	1
> 20	0

Driver experience; avalanche will run in	
½ hour	3
2 hours	1

Index totals / Action called for	
17 – 14	Close highway now
13 – 11	15 minutes
10 – 8	1 hour
7 – 5	2 hours

#### Model #4

Forecasting for wet avalanches from mid-winter thaw, not snowing.

Hours since last 24 hr snowfall of 4" or more at Banner Summit	
24 hrs	4



48 hrs	3
72 hrs	2
96 hrs	1

Max temp at Banner Summit past 24 hrs	
> 40 degrees	4
40 – 35 degrees	3
34 – 32 degrees	2

Min temp at Banner Summit past 24 hrs	
Above 32 degrees	4
Below 32 degrees	2

Cloud cover	
Clear	5
50%	3
100%	1

Snow pack ram # (average of bottom 30 cm)	
0 – 5	3
5 – 10	2
10 – 20	1
> 20	0

Index totals / Action called for	
20 – 17	Close highway now
16 – 14	2 hour
13 – 10	3 hour
9 - 6	Night time cooling may strengthen snow

Model #5

Forecasting for wet avalanches from spring thaw

Hours since last 24 hr snowfall of 2" or more at Banner Summit	
24 hours	4
48 hours	3

72 hours	2
96 hours	1

Max temp at Banner Summit past 24 hrs	
> 50 degrees	6
49 – 40 degrees	4
39 – 32 degrees	1

Min temp at Banner Summit past 24 hrs	
32 degrees or above	6
31 degrees or below	2

Mean 24 hour temp at Banner Summit	
> 32 degrees	4
< 32 degrees	2

Cloud cover	
Clear	4
50%	2
100%	1

Snow pack ram # (average of bottom 30 cm)	
0 – 5	4
5 – 10	3
10 – 20	2
> 20	1

Index totals / Action called for	
34 – 32	Close highway now
31 – 28	1 hour
27 – 24	Close at first sign of sluffing
23 - 9	Critical from 1pm to 6 pm; watch closely

## Model #6

### Forecasting for opening highway after road closure

1. If closure is due to warm temps or rain, wait until cooling trend.
2. If closure is due to dry slab avalanche hazard, wait 24 hours after slope loading stops.  
Continued wind loading in the starting zones after a storm qualifies as slope loading.
3. If snow pack ram number is 0 – 5, wait 48 hours after dry slab avalanche hazard.

Appendix E: Authorized User/Handler of Explosives for Control Work

<b>User/Handler</b>	<b>Position/Title</b>
Jon Barker	Lead Forecaster
Mick Riffie	Assistant Forecaster
Cecil Dallman	Maintenance Foreman
Bob Frisbie	Lowman Lead Worker
Brian Inwards	Lowman Technician
Stuart Wilson	Lowman Technician



Appendix F: Authorized ITD Employees for Helicopter Work

<b>Helibombing Crew Member</b>	<b>Employee</b>	<b>Position/Title</b>
Bombardier	Jon Barker	Lead Forecaster
Primary Ground Support	Mick Riffie	Assistant Forecaster
Discretionary Ground Support	Cecil Dallman	Maintenance Foreman
	Bob Frisbie	Lowman Lead Worker
	Brian Inwards	Lowman Technician
	Stuart Wilson	Lowman Technician
	Steve Erichson	Boise Construction Inspector

### Appendix G: Standard DMS Messages

<b>SCENERIO</b>	<b>STANDARD MESSAGE</b>
<u>Advanced Warning</u>	<u>HWY 21 WILL CLOSE AT (insert time)</u> <u>GRAND JEAN TO BANNER SUMMIT</u>
<u>Road Closure</u>	<u>HWY 21 CLOSED</u> <u>GRAND JEAN TO BANNER SUMMIT</u>
<u>Road Opening</u>	<u>HWY 21 OPEN</u> <u>GRAND JEAN TO BANNER SUMMIT</u>

**Criteria:**

Advanced Warning signs will only be used if there is an eminent closure ahead and there is enough time to give at least 2 hours notice. Advanced Warning signs do not apply to portable message signs.

The road open sign will remain on for 48 hours after the gates are opened.